AppleFax Modem

Copyright 1988, Apple Computer, Inc.

AVAILABILITY: April/May 1988.
Authorized Apple Desktop Communications dealers and resellers only.

The AppleFax Modem brings facsimile connectivity to Macintosh computers, allowing for convenient sending and receiving of facsimile files. In addition, the Apple Fax Modem provides 9600 bps Macintosh data file transfer to another Macintosh similarly equipped with an AppleFax Modem. Since facsimile is a graphics-oriented method of communication, the AppleFax Modem is a logical extension of the graphics and image processing of the Macintosh.

Facsimile machines are currently used to quickly transmit documents between corporate offices, manufacturing facilities, and distribution sites, both domestically and internatonally. With the AppleFax Modem, users have a fast, easy and inexpensive way to transmit to a worldwide installed base of Group 2 and Group 3 facsimile machines, representing over 90% of the facsimile installed base.

The AppleFax Modem includes two pieces of software:

-- AppleFax Resource
-- AppleFax Application Program.

The AppleFax Resource acts very much like a standard printer resource designated through the Chooser and sent by way of the standard Apple printing operation. If users know how to print from a Macintosh, they already know how to send a fax with the AppleFax Modem. And when users send facsimiles to a fax machine using the AppleFax Modem, they'll save time because they won't have to print the document first and then bring the image to a fax machine for scanning.

The AppleFax Application Program is a powerful and easy-to-use program that allows users to send and receive both facsimiles and Macintosh data files. Capabilities built into this program include distribution lists, timed transmissions, and automatic reception. The AppleFax Application Program must be running to utilize these capabilities.

The AppleFax Modem doesn't take up an extra serial port on the Macintosh. Through the implementation of a pass-through serial port and by using a toggle switch on the modem, you can easily connect and switch between the Apple Facsimile Modem and any other peripheral that would otherwise hook directly to the Macintosh, such as the Apple Personal Modem.

Documents received on a Macintosh from a fax machine will be a considerable improvement over the quality of traditional facsimile transmissions. Images are transmitted via the AppleFax Modem in 200 dpi format. Letter-quality fonts that have been optimized for the resolution of fax machines will provide exceptional looking printed output at the destination. Transmissions received by the AppleFax Modem from a standard fax machine can be printed on the LaserWriter, ImageWriter, or ImageWriter LQ printers.

The AppleFax Modem includes the AppleFax Resource, AppleFax Application

Program, a phone line, and power supply. An Apple System Peripheral-8 Cable (M0197) must be purchased separately.

The AppleFax Modem is compatible with the Macintosh Plus, Macintosh SE, and Macintosh II computers, and will be available in Fall 1987 to authorized Apple Desktop Communications dealers and resellers only. In order for the AppleFax Modem to work properly, users must have System 4.1 or later.

AppleFax Modem (M0177)

AppleFax Modem: Overview and Firmware

Overview

The AppleFax Modem allows Macintosh users to send and receive Fax files/documents with the huge installed base of Fax machines currently used by most businesses. In addition to its Fax capabilities, the AppleFax Modem allows 9600 baud file transmission of Macintosh software with other AppleFax Modem users.

The AppleFax Modem's case is exactly the same size as the Apple 3.5" disk drive, letting the two products be stacked. The AppleFax Modem is compatible with Fax 'types' Group 2 and Group 3, which covers over 90% of all Fax machines in use today. The firmware in this unit is a subset of the Hayes-compatible firmware in the Apple Personal Modem.

Availability

The AppleFax Modem will be sold only by authorized Apple Desktop Communications dealers.

AppleFax Firmware

The command set in the AppleFax Modem firmware is a subset of the Hayes command set used in the Apple Personal Modem, with some additional Fax only 'S' registers. The new AppleFax Modem registers are:

- S14 Error Rate / Contains a value that indicates the number of erroneous transmissions that occurred in the last 256 transmissions.

- S32-S64 Modem Chip Set / These registers map to the R96 Fax compatible modem chip set contained in the AppleFax Modem as follows:

Registers S32-47	Bank 0 registers 0..15
Registers S48-63	Bank 1 registers 0..15

The firmware in the AppleFax Modem is compatible enough with the Hayes protocol that it should run with most communication applications (MacTerminal, for example) with no problem. This will allow you to transfer Macintosh files, type messages back and forth with the other AppleFax Modem owner, and in general become familiar with the command set of this modem.

The communication application must follow these guidelines:

- Handshaking	CTS (Clear To Send) or RTS (Return To Send)
- Local Echo	Echo off
- Duplex	Full duplex
- Bits	8 data bits, 1 stop bit and 1 start bit.
- Baud Rate	9600

AppleFax Modem: Software and Application

Software

The unit is shipped with two different types of software. The easiest way to send a Fax is via the "AppleFax Modem" resource file that you place in your system folder, and Print to... just as to a Laser Printer. If you can print, you can send a Fax.

The AppleFax application goes beyond the resource, allowing multiple Fax messages to go to multiple addresses, at pre-set times. The application also allows Macintosh file transfer at 9600 baud.

AppleFax Software

Along with the disk that contains the AppleFax application and the AppleFax Modem resource file, there are three other disks labelled LQ Fonts. The AppleFax Modem works very much like the ImageWriter LQ, in that it requires fonts when "printing" that are 3 times the size of the font on the Macintosh screen. Having these new LQ fonts installed in your system file allows the maximum 200 dpi density of the AppleFax Modem to be utilized. If the proper sized font is not available, resolution will suffer, but the Fax document is still printed to the recipient. This is not an AppleFax Modem to AppleFax Modem exclusive. As long as the fonts are available when the Fax is sent, even a 'normal' Fax machine will benefit for the 200 dpi images sent from your Macintosh.

There are two ways to use the AppleFax Modem. The first is via the AppleFax Modem resource file. Once that resource is dragged into the system folder, and selected via the chooser as the active resource, you're in business. The advantage of using the AppleFax Modem resource is immediate conversion and sending of the document you have selected. You don't even have to leave the active application to send the Fax. You may select any document from within the finder and "Print" it just like you would to a LaserWriter. When the dialog box appears, you have the option of sending the document immediately ("Printing it") or saving it to disk. If you're planning on using the AppleFax application program, for example, to send your multiple Fax documents at 1:00 a.m., you would need to use the "Save Fax To Disk" feature for each Fax you wished to send with the application. You must use the resource to convert your Macintosh documents into Fax documents, which in turn can be used from within the AppleFax application. Once you have all the Fax documents saved to disk, you're ready to move on to the "AppleFax" application.

The AppleFax application program for the AppleFax Modem turns your Macintosh into a top-of-the-line Fax station. The application does require the full attention of the Macintosh and will not run in the background. When the AppleFax application is started up, the user is presented with various options. Some of the main features of the application are:

- Send Macintosh files, such as Macintosh documents and applications.
- Send many files/Fax's to one destination.
- Send a single file/Fax to multiple destinations.
- Specify the time for the AppleFax Modem station to send your files/Fax's.
- Send your files/Fax's to another AppleFax Modem station that will temporarily store and then forward the files to their final destination.
- Send your files/Fax's then prompt the other AppleFax Modem station to send

its files back to you.

Here's a key difference between using the AppleFax resource and the AppleFax application: the application allows you to receive Fax's as well as send them. The resource only allows conversion and sending of the Fax. The application automatically saves the Macintosh files and Fax documents as they are being received from the sender.

More About the AppleFax Application Program

The two main ingredients to the AppleFax Modem application are "Address Books" and "Envelopes." An address book contains the names of various Fax stations that you will be calling, their phone numbers, and the best calling times. Addresses are then dragged over to 'empty' envelopes which then become AppleFax Modem application documents. You will be given the opportunity to place Macintosh files, and previously created Fax's, into the envelope. Once that's done, you may either wait for the envelope to be sent at the time indicated, or send it 'immediately.'

If you choose to allow the envelope to be sent at the pre-set time, when you come back, it is wise to check the "Activity Report". This will tell you if the contents of the envelope were really sent, when, and any other problems encountered.

One important note here. When an entry into the address book is created, one of the choices is whether or not this address belongs to a 'normal' Fax machine, or to a AppleFax Modem. This is important, for when you drag your address into an empty envelope, that envelope becomes either a Fax machine only envelope or a Fax document and Macintosh files envelope, for use with other AppleFax Modem stations. If you wish to send to separate types of stations in the same session, more than one type of envelope can be created.

AppleFax Modem: Hardware Description

On the back of the AppleFax Modem, you will find:

- On/Off Switch

- Two line jacks, phone line / phone set
(RJ-11 type, identical in function)

- Two minicircular 8-pin serial ports, Pass through / Fax to Mac
(Allows pass through to second serial device from one Mac port)

- One 7-pin DIN power connector
(+5dc, -5dc generated within unit, +12dc, -12dc)

- Security cable socket
(Newer, smaller version of security socket)

The power source is external, similar in function and size to the Apple IIc power supply, but with a 7-pin power connector instead of 5-pin. There are also two LED indicators on the front of the unit, one yellow and the other green. These indicate the state of the pass through port on the back of the AppleFax Modem. With the yellow light on, the AppleFax Modem is disabled and you're passing through the serial data to the device (usually an Apple Personal Modem) plugged into the 'phone port' (pass through) on the AppleFax Modem (Note: AppleTalk devices cannot be used on the pass through port.) With the green light on, the serial data is going directly to the AppleFax Modem and the pass through port is disabled. The button located between these two LEDs lets you toggle between the two states. There is no software control of this function.

There is also a sliding control on the right side of the unit. This sliding control is used for volume adjustment, the detent being a default volume level. This unit behaves very much like the Apple Personal Modem when dealing with the speaker. The DTMF tones are passed through to the speaker, as well as the connection 'tones,' until the attempt at a connection is successful and both Fax units sync up, shutting off the speaker. Beyond that, there are the same ATM commands available for the user to adjust for different speaker behavior. The speaker is located on the bottom of the case, with slots for the sound to come out.

AppleFax Modem: Spec Sheet

This article last reviewed: 28 January 1988

- General

Microprocessor - 65C112
Timing - 1.8432 MHz
ROM - 32k x 8
RAM - 8k x 8
Modem Type - R96 Fax compatible chip set
Modulation - Quadrature Amplitude Modulation (QAM)
- Frequency Shift Key (FSK)
- Amplitude Modulation (AM)
- Single SideBand (SSB)
Receiver Level - -10 to -40 dBm
Transmit Level - -10 dBm, fixed per FCC part 98

Signaling and Data Rates

- 2400 baud	9600, 7200, 4800 bps
- 1600 baud	4800 bps
- 1200 baud	2400 bps

Carrier Frequencies

- T.3	2100 Hz
- V.27 ter	1800 Hz
- V.29	1700 Hz

Data Format - Asynchronous
- G2 and G3 protocols supported
- Character length: 7 or 8 data bits / 1 or 2 stop bits
- Parity: odd, even, or none
- Half Duplex

- Environmental

Operating Temp. - +10 to +40C (50F to 104F)
Storage Range - -40 to +47C (-40F to 117F)
Transit Range - -40 to +65C (-40F to 149F)
Humidity Range - 20% to 95% RH (non-condensing)
Maximum BTUs - 34.2

- Physical

Depth - 7 7/8 in. (20.0 cm)
Width - 4 3/4 in. (12.0 cm)
Height - 2.0 in. (5.0 cm)
Weight - 1.5 lbs (.91 kg - excluding power supply)

- Power Requirements

AC Input - 120v +/-10%, 60Hz (U.S. & Canada)
Consumption - 10 watts maximum

Info on FAX modem please

QUESTION--

I want to confirm a rumor. I have been led to believe that our new FAX modem will only transmit documents to an analog FAX machine (or a Mac), and that we are not able to receive documents that were generated on an analog machine.

RESPONSE--

Apple's FAX modem will transmit, or receive, over normal telephone lines, documents with any FAX device that supports the CCITT Group 2 or Group 3 FAX standards. All modems take digital information and modulate it into an analog form when sending a file. The information is then demodulated into digital form when receiving the file. The CCITT Group 3 FAX standard is in use by the majority of installed FAX devices; very few CCITT Group 2 devices are in use today.

IN: 09-29 OUT: 09-29 DB: NO

This article WILL NOT be included in the Tech Info Library.

APPLE EYES ONLY

FAX question

QUESTION--

I have a question concerning the Apple FAX modem. Will it allow you to recieve
FAX files in the background? For example, if you have a FAX modem attached to a Mac and turned on, and a call to the FAX comes in, what happens? Will there be an application that will work in the background under multifinder?

RESPONSE--

No, the Apple FAX Modem will not support background file transfers when launched under MultFinder. The FAX software needs to be the foreground application to receive or send files if running in the MultiFinder environment. Currently there are no plans to support background file transfers with the FAX modem.

IN: 10-06   OUT: 10-06   DB: NO   ITEM#: 7714665

This article WILL NOT be included in the Tech Info Library.

APPLE EYES ONLY

Apple Fax Modem Can't Be Networked, Can Be Shared

QUESTION--

I understand that the Apple Fax Modem is designed to work 1-to-1 with a Macintosh: one Macintosh, one modem. Could it also be run on a network server or AppleTalk serial device so that several people could use it?

RESPONSE--

The Apple FAX modem connects directly to the modem serial port on the Macintosh. It can't be run from an AppleTalk connection.

Another solution: use a serial switching device that lets multiple Macintoshes share the modem.

IN: 11-05 OUT: 11-05 DB: NO ITEM#:050953590

This article WILL NOT be included in the Tech Info Library.

APPLE EYES ONLY

FaxTest 1.0 and Cursor Ghosts

When any of the tests in the FaxTest program are chosen and put into a loop for a random amount of time, ranging anywhere from 12 to 38 minutes, the cursor develops a trace. This could appear on the screen in either the shape of a watch or an arrow. These traces will multiply as time goes by and will remain until the program is interrupted by either quitting or calling up one of the other choices on the desktop menus.

This problem does NOT interfere with proper testing of the FaxModem and will be corrected in the next release of the FaxTest diagnostic.

AppleFax Application Release Notes 1.0b9.4

Bug Fixes:

1. Fixed save of address book file to a locked disk/locked file - error recovery, causing failure when closing the app, not changing the default file setting, not changing the save state of the file.

2. Fixed check of the address book display size to fail when the value goes negative the first time.

3. Added check of the acivity report display size (like address book).

4. Added checks for bad files during GetInfo call when adding files to envelopes.

5. Added check for reading too little of a file during xmit file data.

6. Fixed error reporting for writing address book files.

7. Bumped ICO delay time to 30 seconds.

8. Bumped disconnect delay time to 30 seconds.

9. Added disconnect message to xmit/recv dialogs during the 30 second wait.

10. Centered the phone is ringing alert on the screen.

11. Fixed fax error messages in resource file. (Messages were screwed up in the activity report.

12. Moved the rest of the strings into the resource file for International.

13. Fixed using an ICO for a dist list where one of the addresses in the list has the same ICO address. This is an error for the dist. list.

14. Changed fax capabilities to accept pages of any length.

M0177 APPLEFAX MODEM

FIRST SHIPPING:

April 18, 1988
(First introduced August 15, 1988)

PRODUCT DESCRIPTION:

The AppleFax Modem is a convenient way to send fax files to virtually any standard facsimlie machine. It also allows the exchange of data files with other Macintosh computers with AppleFax Modems.

FEATURES:

- May be used as a standard 2400 baud modem.
- Compatible with Group 2 and Group 3 facsimile machines.
- Rapid file transfer (9600 bps) between Macintosh computers equipped with AppleFax Modems.
- Allows files to be printed on a LaserWriter, ImageWriter or ImageWriter LQ.
- Delivers higher-quality transmissions to facsimile machines than those originating from standard fax machines.

CONTENTS:

AppleFax Modem	Qty. 1
Telephone cord with two RJ-11 jacks	Qty. 1
AppleFax application software	Qty. 1
AppleFax Resource utility	Qty. 1
Three LQ Fonts disks	Qty. 1
Owner's guide	Qty. 1
Limited warranty statement	Qty. 1

COMPATIBILITY:

Compatible with a Macintosh Plus, Macintosh SE, or Macintosh II CPU.
An Apple System Peripheral - 8 Cable (M0197) is required.

AVAILABILITY:

Below is the scheduled build and forecast:

	April	May	June	July	Aug
Build:	2500	1700	1920	2000	1540
Forecast:	1675	1184	1258	1262	1437

M0177 APPLEFAX MODEM

PACKAGING:

Unit of Measure:	Each
Pallet Quantity:	64
Master Pack:	None
Single Pack Carton Size:	12.1" x 9.8" x 10.6" (est)
Weight per Single Pack Carton:	7.0 lbs (est)

OBSOLESCENCE/DISPOSITION:

Not applicable.

BACKLOG CONVERSION:

Not applicable.

BUNDLES:

The AppleFax Modem is in the following bundle:

M5202	AppleFax Modem w/System Peripheral Cable

OTHER:

Dealer, VAR and Higher Ed Reseller channel distribution is limited to authorized Desktop Communication (DTC) resellers only.

from a thrifty $395 to a very pricey $1,495. Although all the fax boards in this comparison have built-in facsimile-transmission modems that comply with the CCITT Group III standard, only one of them has a built-in Hayes-compatible modem. All of the fax modems in these boards run at 9,600 bps, except for the one in the JT Fax, which is only half as fast.

All of the fax boards we tested transmit text and graphics files, albeit with varying degrees of success and accuracy, and none of them posed problems for other add-in boards that were present in our Tandy 3000 AT-compatible test system.

How Fax Boards Work

Assume you have a memo to send to half a dozen people, each of whom has a stand-alone fax machine or a fax board in his or her desktop PC. Some fax boards can transmit your memo exactly as it was produced by Word Perfect, Microsoft Word, Wordstar, or another word processing program. If your fax board can't do that, your word processing program has to convert the file to ASCII format so your fax board can send it.

Graphics files are yet another kettle of fish. Most fax boards can handle de facto standard graphics formats such as TIFF, PC Paintbrush, or Publisher's Paintbrush files. If your graphics program cannot generate a file that's compatible with the fax board transmission format, you're out of luck.

For simplicity, then, assume your memo is in ASCII text form. You load the fax board software into your system's RAM and tell it that you want to send an ASCII file to those six colleagues, specifying their phone numbers. The fax software converts the ASCII file into a fax "image." It does this by reading each character in the ASCII file and then "painting" that character in the output fax image file. In this procedure (called "rasterizing"), the software creates a dot-pattern equivalent of each ASCII character — the same way a dot-matrix printer or laser printer does. (Graphics files are a different matter. When fax board software converts graphic material to fax format, all it has to do is convert the picture's resolution [number of dots per inch] to the resolution the fax board can transmit. That may sound simpler, but the mechanics of the resizing make the procedure more complicated.)

Once the file to be transmitted is in fax format, the software places the call to each addressee in turn via the board's on-board modem and makes contact with the fax board in the addressee's desktop PC. When the connection is established, your fax board transmits the fax image to the receiving fax boards one at a time, breaking the connection after each transmission. (If an addressee's fax board is busy or doesn't answer, the sending fax board retries the connection a certain number of times.) After all the specified transmissions have been completed and the fax board at the receiving end has stored the transmitted file on disk, your fax board breaks the connection and returns control of your computer to you.

At this point, for recipients who are using fax boards, your memo exists only on a floppy or hard disk in the recipient's PC. In order to read your memo, your addressee has to either call it from the disk and display it on-screen or send it directly from the disk to a printer. For recipients who are using stand-alone fax machines, your memo is printed directly on thermal paper in the usual way.

— *Barbara Clifford*

The Complete PC

THE COMPLETE FAX

All of the fax boards we tested have port or interfaces for a scanner. The Complete Fax is alone among them in interfacing directly to a hand-held scanner: in this case a sister product, the $249 Complete Hand Scanner. This interface makes it much easier to use the Complete Fax to transmit files that aren't already in electronic form.

In terms of speed, the Complete Fax fared best in graphics file transmission. The time it took to send a Paintbrush image put it in the good range in this category; its ASCII transmission scores were the slowest among all the boards we tested, forcing us to conclude that the Complete Fax is clearly better suited to service as a graphics file sender than as a text-transmission device. We rate speed satisfactory.

When we examined the quality of the Complete Fax's transmissions, we found a dropped scan line in one of the text files. Among the graphics files, the Publisher's Paintbrush file had a couple of missing lines near the top of the image. These were minor problems and didn't keep us from rating reliability good.

The Complete Fax supports direct translation of word processing files to ASCII text, if those files are set up to be printed on an Epson printer. It also supports the major laser and dot-matrix printers. In the supplementary features category, the Complete Fax earns a score of very good.

The documentation for the Complete Fax is short on illustrations but long on structure and content. Basic and advanced installation instructions cover hardware and software. The one-page troubleshooting section is less than comprehensive, containing no information about error messages. The manual has an index and glossary and comes with a quick reference card. Because of its structure and content, we rate documentation good.

Incidentally, we were glad to find the Complete Fax doesn't have a speaker. Not having to listen to beeps and buzzes was a pleasant change. We found no glitches or conditions that made the board hard to use. Overall, ease of use was satisfactory.

The workmanship of the Complete Fax is in the middle range, with standard board layout and physical construction. There were no added components, wires, or cold-solder joints. We rate workmanship good.

PRODUCT SUMMARY

COMPLETE FAX

Company: The Complete PC Inc., 521 Cottonwood Drive, Milpitas, CA 95035; (800) 634-5558, (408) 434-0145.
List Price: $499.
Pros: Fast graphics transmission; inexpensive.
Cons: Slow ASCII translation and text file reception.
Summary: A solid, relatively low-cost utilitarian board, especially for graphics.

Complete PC offers an unusually short 90-day warranty on the Complete Fax. Repairs are handled through either dealers or the vendor, with no specified turnaround time. The warranty period forces us to rate support policies poor.

Technical support for the Complete Fax is free, but the phone call isn't. We generally had no trouble getting through. When we had to leave a message, our calls were returned promptly. Overall, the quality of Complete PC's support was admirable. All of our questions were answered completely and courteously. Technical support earns a good score.

Like the DEST Facsimile Pac and the Quadram JT-Fax, the Complete Fax is a generally low-speed product that ranks slightly above average in other areas. At $499 it costs $100 more than the Quadram JT-Fax, but that price isn't out of line, given its features. If you need to transmit a lot of graphics files but relatively few ASCII or word processing files, the Complete Fax is a safe, inexpensive choice and a very good overall value.

Datacopy

MICROFAX

Datacopy's Microfax board comes with a built-in Hayes-compatible modem — a feature other boards offer only as an extra-cost ($130 to $200) option — and supports more printers and scanners than any other board we tested.

Unlike the Complete Fax, the Micro-

How We Got Here: A Brief Historical Glossary of Faxensprache

ASCII — American Standard Code for Information Interchange. It really is a standard and in use by a wide majority of users throughout this country and the world. ASCII defines the bit patterns that stand for characters (letters, numbers, punctuation, and control codes) used by most PC software, on-line information services, and electronic mail services (such as MCI and Western Union Easylink). Most fax board software for PCs can convert ASCII files to fax images. ASCII is also used in the Group IV facsimile standard.

Facsimile — "An exact copy or likeness" (*New Webster's Dictionary of the English Language*, 1981). Facsimile transmission sends an image (text, graphics, photographs, or any black-and-white printed material) electronically from one place to another.

CCITT — The Comité Consultatif International Téléphonique et Télégraphique (International Telegraph and Telephone Consultative Committee), which sets internationally used standards for voice, picture, and data transmission.

Group I Facsimile — CCITT document-transmission standard, first promulgated in 1968. Group I specifies how A4-size (8 by 11½ inches) documents are transmitted via analog signaling over dial-up phone connections. Each page is sent in the form of 1,144 scan lines at a rate of 180 lines per minute, for a typical total transmission time of about six minutes per page. (CCITT Recommendation T.2)

Group II Facsimile (1976) — Similar to the Group I standard, except pages are transmitted twice as fast — each in about three minutes — and gray levels (in addition to black and white) can be reproduced. The document is sent in 1,145 scan lines at 300 lines per minute. (CCITT Recommendation T.3)

Group III Facsimile (1980) — Equipment implementing the Group III standard sends an 8-by-11½-inch typewritten page in one minute or less. (The fax boards in this report all comply with the Group III standard.) Each page is transmitted in 1,083 scan lines of 1,728 pixels each. This corresponds to an image resolution of 204 dots per inch horizontally by 96 dpi vertically. A higher-resolution mode doubles the number of scan lines, increasing vertical resolution to 196 dpi. Each digital scan line is compressed to speed transmission. Modems send the data at 2,400 and 4,800 bps (optionally at 7,200 and 9,600 bps). (CCITT Recommendation T.4)

Group IV Facsimile (1984) — Equipment designed to this standard transfers documents over very fast digital circuits and networks, sending each page in less than 10 seconds. Protocols ensure error-free transmission (not the case in Group I through Group III). Group IV images are compressed. Documents are sent at 200 by 200, 240 by 240, 300 by 300, or 400 by 400 dpi. We know of no PC fax boards that implement the Group IV standard. (CCITT Recommendation T.5)

ISDN — Integrated Services Digital Network. Currently under development, the goal being to provide data transfer speeds of up to 64 kilobits per second.

Pel — Picture element. See **pixel**.

Pixel — Picture element. The smallest transmissible image unit of a document.

Raster line — See **scan line**.

Resolution — The number of pixels in an area of the page. Applies only to digital picture transmission, which (unlike analog fax transmission) breaks a document into discrete horizontal picture elements.

Scan Line — The smallest horizontal strip of a document as recognized by the fax equipment. The scanner in a fax machine looks at this strip (which is about 0.005 to 0.010 inches wide) and transmits what it "sees" to the receiving machine.

— *Stephen T. Satchell*